

## **I. INTRODUCTION**

### **PURPOSE AND SCOPE**

The South Florida Water Management District (SFWMD or District) has undertaken development of long-term, comprehensive regional and county-level water supply plans to provide better management of South Florida's water resources. The Lower West Coast (LWC) Planning Area is one of four regional planning areas, as indicated on Figure I-1. These regions are defined by hydrologic divides and represent areas displaying similarities in development patterns, degree of urbanization, and water management issues and concerns.

The LWC Water Supply Plan is comprised of three documents: the LWC Water Supply Plan Planning Document (Volume I), the LWC Water Supply Plan Background Document (Volume II), and the LWC Water Supply Plan Appendices (Volume III).

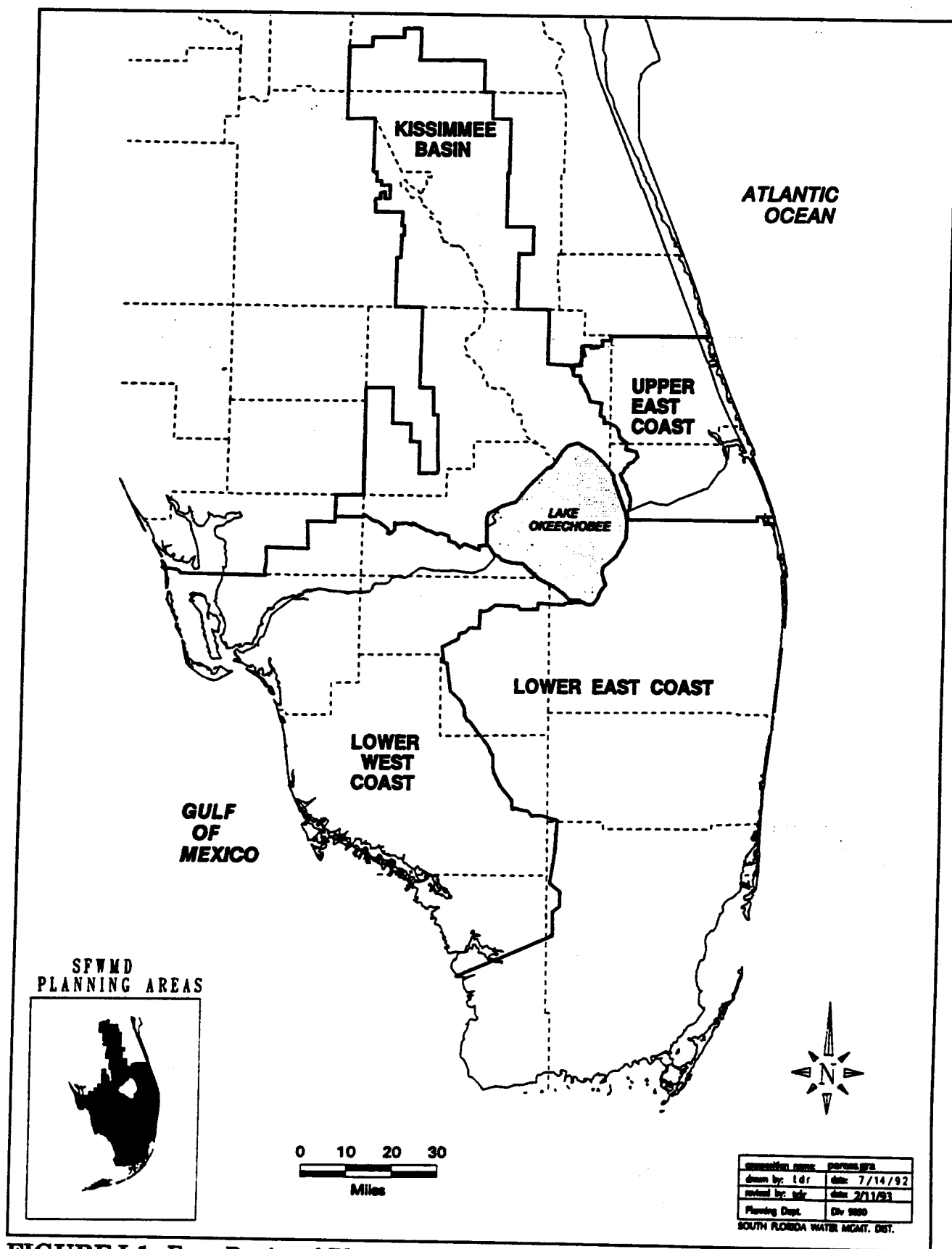
This purpose of this LWC Water Supply Plan Background Document (LWC Background Document) is to provide a common set of data, assumptions, and potential water supply options for use by the District, the LWC Advisory Committee, other agencies, counties, municipalities, utilities, and other interested parties in development of the LWC Planning Document. The planning document, which is based on input from the background document, describes the results of the ground water modeling process, and makes recommendations that address problem areas where resource protection criteria were unmet. The planning document provides the framework within which the District may implement the LWC Water Supply Plan through regulation/permitting, planning, research, and land acquisition.

Local governments and utilities may use the planning document, background document and appendices, which comprise the LWC Water Supply Plan, to modify and update their local comprehensive plans, ordinances, and individual or regional utility plans.

### **BACKGROUND DOCUMENT DESCRIPTION**

This Background Document is organized into six chapters: Chapters I through III provide an overview of the planning area, including its water resources, treatment facilities, and environmental features. Chapter IV documents the SFWMD's projections of water demands for urban and agricultural uses through the year 2010. In Chapter V, water conservation measures that reduce water demands, and supply alternatives that increase water supply are introduced, some of which are simulated with the ground water models used in the Planning Document. Chapter VI is an analysis of the alternatives to meet future demands that minimize the acreage where resource protection criteria were unmet. The "References Cited" section provides a list of literature cited in the three volumes of the LWC Water Supply Plan.

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**FIGURE I-1. Four Regional Planning Areas.**

## BASIS OF WATER SUPPLY PLANNING

### Legal Authority and Requirements

The District is charged by the Florida Legislature with managing water use in South Florida. One important task in this charge is planning for future water demand in specific geographic regions within the District. In partial fulfillment of this requirement, the District has prepared a water supply plan for the LWC Planning Area. The following discussion describes the legal basis for the District's water supply planning program. Excerpts of specific Florida statutes and administrative codes cited in this section are provided in Appendix A.

Water supply planning activities were first required of the state's water management districts following adoption of the Florida Water Resources Act of 1972 (Chapter 373, Florida Statutes). The authors of *A Model Water Code* (Maloney *et al.*, 1972), upon which much of Chapter 373 is based, theorized that proper water resource allocation could best be accomplished within a statewide, coordinated planning framework. The "State Water Use Plan" (Section 373.036, Florida Statutes) and the "State Water Policy" (Chapter 17-40, Florida Administrative Code) are the primary planning documents to achieve proper water resource allocation.

Chapter 373, F.S. requires the Florida Department of Environmental Protection (FDEP) to prepare a State Water Use Plan. The State Water Use Plan defines objectives and operating policies which implement selected goals and policies of the State Comprehensive Plan (Ch. 187, F.S.). Chapter 187 provides guidance for all state agencies as they develop their "agency functional plans," and to the water management districts, as they develop their water management plans. More specific guidelines for these plans are provided in the State Water Policy (Ch. 17-40, F.A.C.).

Water management districts, pursuant to Part V of the State Water Policy, are required to prepare water management plans. These plans must be consistent with the State Water Policy and the Florida Water Resources Act of 1972. The water management plans are to include an assessment of water needs and supply sources and identification of critical water supply problem areas within the next 20 years. Each district must complete a water management plan by November 1, 1994, which at a minimum, must be updated every five years.

### Water Supply Planning Initiative

The District is undertaking efforts to develop a water management plan, ensure prudent management of South Florida's water resources, and fulfill the planning and implementation directives of the Florida Water Resources Act of 1972. The District's initiative incorporates five components, each of which are described below:

- Develop water supply policy guidelines.
- Develop regional water supply plans and, where appropriate, more localized water supply plans for one or more counties.
- Prepare water supply elements for Surface Water Improvement and Management (SWIM) plans.
- Update the District's Basis of Review (BOR) for Consumptive Use Permitting.
- Address other water supply related programs (i.e., Water Supply Needs and Sources, and Critical Water Supply Problem Area Rule).

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**Develop water supply policy guidelines.** The District's Water Supply Policy Document was accepted by the Governing Board in December 1991. This direction-setting document is the SFWMD's interpretive summary of the many water supply policy directives and statements that are found in the state statutes and administrative rules. A summary of the District's goals and policies, as derived from state law, are summarized on page I-5 of this document.

**Develop regional water supply plans and, where appropriate, more localized water supply plans for one or more counties.** Water supply plans are based upon data that is related to the specific needs, sources and environmental features of distinct planning areas, including individual county plans where appropriate. The District's schedule calls for four regional plans, including plans for the Lower East Coast, the Lower West Coast, the Upper East Coast and the Kissimmee Basin. These four regional plans will cover the entire SFWMD. The LWC Water Supply Plan is an important regional component of the water management plan. Please refer to the References Cited section (under SFWMD) for a listing of the available water supply plans.

**Prepare water supply elements for Surface Water Improvement and Management (SWIM) plans.** The integration of water supply planning and SWIM planning is a critical link between efforts to balance the environmental water quantity and quality requirements with the maximum reasonable-beneficial use of the resource. Because water supply elements are key components of SWIM plans, the water supply planning process takes into consideration the water quantity, environmental, and other related goals of SWIM plans. This will allow the water supply plans for specific regions to be incorporated into SWIM plans with minimal conflict.

Three SWIM plans have begun implementation: the Biscayne Bay SWIM Plan, the Indian River Lagoon SWIM Plan, and the Lake Okeechobee SWIM Plan. Both the Biscayne Bay SWIM Plan and the Indian River Lagoon SWIM Plan were adopted in 1988 and revised in 1989. Updates to these plans are underway, and both plans are expected to be completed in early 1994. The Lake Okeechobee SWIM Plan was enacted in 1989 and updated in January 1993. The 1993 update added new elements to address water supply, flood protection and environmental aspects of Lake Okeechobee management.

**Update the District's Basis of Review (BOR) for Consumptive Use Permitting.** The term *Basis of Review* refers to the District's "Management of Water Use Permitting Information Manual Volume III" (1993). The BOR is the District's formal criteria document governing the issuance of water use permits, and is part of the District's regulatory program. As the result of the development of the Water Supply Policy Document and new regulatory criteria generated from the water supply plans, the District's Basis of Review for consumptive use permits will be amended and serve as an important tool to implement the water supply planning initiative.

**Other Water Supply Related Programs.** The District has other water supply related programs that lend themselves to development and implementation of the Water Management Plan. The "Water Supply Needs and Sources" document, completed in 1992, provides a preliminary identification of the District's projected demands and supply potential for specific regions over the next 20 years. The demand and supply projection periods have been established from 1990 to 2010 in the

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Water Supply Needs and Sources document and the water supply plans to facilitate the process of completing the District Water Management Plan.

In addition, the Critical Water Supply Problem Area Rule (Chapter 40E-23, F.A.C.), as required by Chapter 17-40, F.A.C., was adopted in October 1991. This rule identifies areas that presently have, or are expected to have, critical water supply problems during the next 20 years. A reasonable amount of reuse of reclaimed water from domestic wastewater treatment facilities is required within these areas. A majority of the LWC Planning Area is designated as a Critical Water Supply Problem Area, except for Charlotte County and a portion of Glades County. The State Water Policy requires these designations to be updated within one year of completion of the District Water Management Plan and its future updates.

### District Goals, Directives and Policies

The District's Water Supply Policy Document provides an interpretative summary of state statutes and rules governing the uses of surface and ground waters in Florida. Selected excerpts from state water law can be found in Appendix A of the LWC Water Supply Plan. The District's overall water resources goal, as presented in the State Comprehensive Plan (Chapter 187, F.S.) is:

"Florida shall assure the availability of an adequate supply of water for all competing uses deemed reasonable and beneficial and shall maintain the functions of natural systems and the overall present level of surface and ground water quality. Florida shall improve and restore the quality of waters not presently meeting water quality standards."

This goal will be achieved by balancing six principal water supply directives embodied in Florida law, and implementing them through the related water use policies established by state law, administrative rule, and the District's Governing Board. The six directives are presented in Figure I-2.

#### WATER USE DIRECTIVES

1. Prevent wasteful, uneconomical, impractical, or unreasonable uses of the water resources.
2. Promote economic development of the water resources consistent with other directives and uses.
3. Protect and enhance environmental resources while providing appropriate levels of service for drainage, flood control, water storage, and water supply.
4. Maximize levels of service for legal users, consistent with other directives.
5. Preserve and enhance the quality of the state's ground and surface waters.
6. Develop and maintain resource monitoring networks and applied research programs (such as forecasting models) required to predict the quantity and quality of water available for reasonable-beneficial uses.

**FIGURE I-2. Six Water Use Directives Derived from State Law.**  
Source: SFWMD Water Supply Policy Document, 1991.

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The state's policies strongly endorse conservation of available supplies, diversification of potential supply sources, protection and enhancement of water quality, and protection of environmental, fish and wildlife resources. At the same time, the state and the District are sensitive to the requirements of the region's population, and the need to provide clean water for drinking, other domestic uses, and agriculture.

### **PUBLIC AND AGENCY PARTICIPATION**

Public and agency involvement was critical in the preparation of the LWC Water Supply Plan. The steps listed below were taken by the District to ensure adequate public input.

#### **LWC Water Supply Plan Advisory Committee**

One important aspect of the water supply planning process for the LWC Planning Area was the formation of a broad-based advisory committee consisting of representatives from interested and affected parties in the study area. Committee participants include representatives from utilities, agribusiness, government, environmental interest groups and others. The responsibility of this committee is to review and comment on this background document, and to advise and participate in development of the LWC Water Supply Plan. The advisory committee provided an effective forum for all interested parties to participate in plan development. Committee meetings were open to any interested members of the public that wish to attend. Dates and locations of the advisory committee meetings were provided in various mailings, such as meeting announcements, periodic newsletters, and notices published in the Florida Administrative Weekly. A list of Advisory Committee members is provided in Appendix J.

#### **LWC Newsletter**

In addition to the LWC Advisory Committee, the District published the LWC Water Supply Newsletter, which was directed towards informing affected and interested parties of the status and progress of the LWC Water Supply Plan. The newsletter includes summaries of advisory committee meetings, opportunities for input and participation, and other associated information. Four newsletters were mailed throughout 1991 and 1992 to approximately 150 individuals and groups including elected officials, civic groups, utilities, environmental groups, agribusiness and other individuals.

#### **Data Confirmation**

The technical information incorporated into this background document is the basis for discussions of water demand and availability in the LWC Planning Area; it is also the key data for computer evaluation (i.e., predictive modeling and analysis of water management alternatives) of the water resources. Therefore, it is important that this information is accurate so that areas where projected demands may exceed resource protection criteria are identified and the most appropriate solutions are presented.

The District initiated data collection and preliminary planning efforts for the LWC Water Supply Plan in 1991. As part of this effort, many entities, such as local governments, state and federal agencies, environmental groups, agricultural

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interests, and utilities within the LWC Planning Area, were contacted to gather initial input and information, and informal meetings were held with several of these groups. Examples of agencies contacted early in the process are:

- Collier County Utilities Department
- Collier County Growth Planning Department
- Big Cypress Basin Board
- Collier County Environmental Services Division
- Florida Game and Fresh Water Fish Commission (Punta Gorda Office)
- Southwest Florida Regional Planning Council
- Lee County Division of Water Resources
- Lee County Department of Growth Management
- Lee County Department of Community Development
- Lee County Division of Environmental Sciences
- Lee County Regional Water Supply Authority
- Hendry County Planning Department
- Hendry County Agriculture Extension Office
- Gulf Citrus Growers Association

### **Utility Information**

It is important that the LWC Water Supply Plan is consistent with existing water supply utilities. To accurately reflect historic, current and projected water supply practices by the utilities in the LWC Planning Area, the District initiated an exhaustive survey of all regional public and private water and wastewater utilities in the study area. The utilities were sent a questionnaire addressing existing and future customers, service areas, treatment technologies, average daily flows, treatment plant locations, number of wells, interconnects with other utilities, and planned expansions for their respective utilities. Follow-up telephone calls were made to those utilities who did not respond, or whose response was incomplete.

This information was tabulated in a computerized spreadsheet and checked against other District sources, such as permits and comprehensive planning documents, for accuracy. Where inaccuracies were found, additional follow-up contacts were made. To assist utilities in planning their future wellfields, information on wellfield protection ordinances was collected and is provided in Appendix H.

### **Population and Urban Demand Projections**

Population projections were taken from local government comprehensive plans so that the LWC Water Supply Plan is consistent with, and supports, local and state growth management policies. The population projections were broken down by utility service area and further adjusted to account for self supply. The District's population and per capita water demand calculations were mailed to local governments and utilities for their review. Their comments and concurrence on the population and demand projections was requested.

## PLANNING AREA DESCRIPTION

### Plan Boundaries

The LWC Planning Area is one of four regional planning areas for which the District is preparing regional water supply plans, as indicated in the introduction. The planning areas are defined by the drainage divides of major surface water systems in South Florida. The major water bodies considered in establishing these boundaries include the Kissimmee River, Lake Okeechobee, the Everglades and the Big Cypress Swamp. The series of canals, levees, pump stations, and storage areas that comprise the Central and South Florida Flood Control (C&SF) Project were also considered when the boundaries were established because these structures have altered the hydrology of the natural water bodies (see Surface Water Resources discussion in Chapter II).

The LWC Planning Area includes all of Lee County, most of Collier and Hendry counties, and a portion of Charlotte, Glades, Dade, and Monroe counties (Figure I-3). Only Lee County is entirely within the planning area; the remaining counties are shared with other regional planning areas. The portions of these counties within the LWC Planning Area are referred to as the Collier County Area, Hendry County Area, Charlotte County Area, Glades County Area, Dade County Area, and Monroe County Area. The boundaries of the LWC Planning Area generally reflect the drainage patterns of the Caloosahatchee River basin and the Big Cypress Swamp. The northern boundary corresponds to the drainage divide of the Caloosahatchee River, which is also the SFWMD/SWFWMD jurisdictional boundary in Charlotte County, while the eastern boundary delineates the divide between the Big Cypress Swamp and Everglades system. The area east of this divide is in the Lower East Coast Planning Area.

The modeling analysis of water supply alternatives for this plan focused upon Lee County and those portions of Collier and Hendry counties within the LWC Planning Area because most of the current and projected demand occurs in these areas. However, agricultural demand estimates were developed for the Charlotte County and Glades County portions of the planning area. There are no agricultural or urban demands for the Dade and Monroe county areas because these areas entirely consist of portions of Everglades National Park and the Big Cypress National Preserve. The portion of Dade County within the LWC Planning Area is too small to effectively be represented in the LWC Water Supply Plan.

### Related Planning Areas

The District has established four water supply planning areas for the (1) Upper East Coast, (2) Lower East Coast, (3) Lower West Coast, and the (4) Kissimmee River Basin regions. Lake Okeechobee is considered part of each of the planning areas, which are connected to the lake through a surface water system. The Kissimmee River is the predominant inflow to the lake, while the remaining three planning areas receive outflows from the lake. The major outflows are to: (a) the Caloosahatchee River to the Lower West Coast, (b) St. Lucie Canal to the Upper East Coast, and (c) the West Palm Beach, Hillsborough, North New River, and Miami canals to the Lower East Coast. The Caloosahatchee River (C-43) and the St. Lucie Canal (C-44) are used primarily for water releases from the lake when lake levels exceed water stages of the U.S. Army Corps of Engineer's regulation schedule.

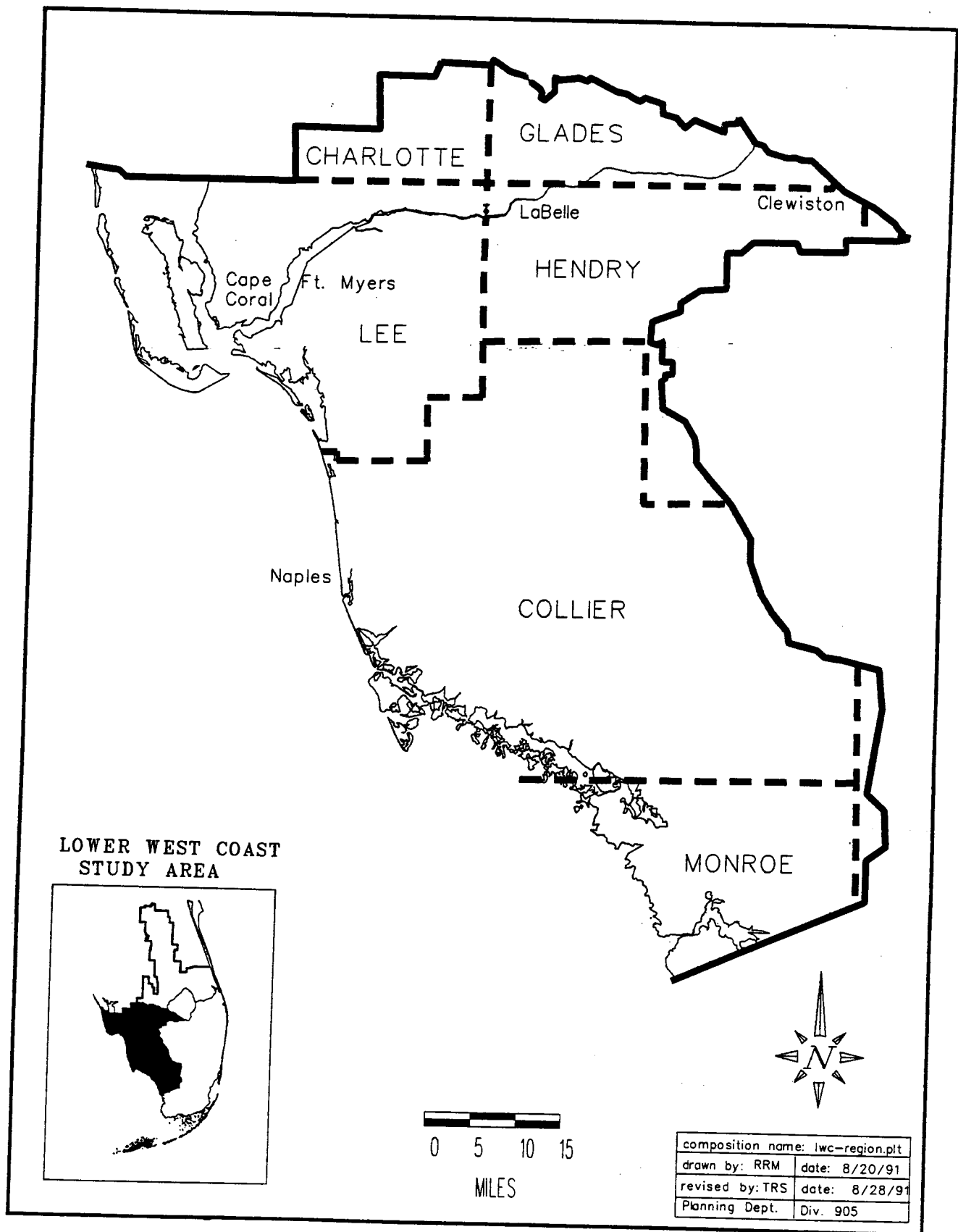


FIGURE I-3. Lower West Coast Planning Area.

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In addition to regulatory discharges for flood protection, these canals receive water deliveries from the lake to maintain water levels for navigation, salinity control, and water supply. In the Caloosahatchee River, these water deliveries provide salinity control for potable water supply intakes located at the freshwater terminus of the river (C-43).

The LWC Planning Area is partially dependent on the lake for supplemental water supply and aquifer recharge. The Lake Okeechobee SWIM planning process will evaluate changes to the lake regulation schedule that are proposed to reduce excess flows from regulatory releases, while maintaining navigational requirements. The process will also consider potential impacts to the Caloosahatchee Estuary that may result from changes in lake levels. The Lake Okeechobee SWIM Plan analysis does not take into consideration the effects of lake levels on water supply to the Caloosahatchee basin.

The Lower East Coast Regional Water Supply Plan is examining the effects of future water supply demands on lake levels, storage, and impacts to the Caloosahatchee Estuary. The results of the Lake Okeechobee SWIM Plan and Lower East Coast Regional Water Supply Plan analyses will be considered in terms of effects on water supply from the Caloosahatchee River in the next update of the Lower West Coast Water Supply Plan.

### Land Use

Table I-1 shows the percentage of land uses in each of the regions within the LWC Planning Area. The LWC Planning Area is predominantly agricultural, especially in the Charlotte, Glades, and Hendry county areas. The Monroe County Area is almost entirely covered with wetlands, while Lee County contains the most urban land use. Land use maps for each of the counties are provided in Appendix B.

The system of drainage networks that make Southwest Florida fit for human habitation and agriculture have resulted in profound changes to the landscape. Very little of the original Everglades remains on the northeastern margin of the LWC Planning Area since its rich peat soils were drained for agricultural development. In other developed areas, such as Golden Gate Estates North in Collier County, urban growth has occurred on otherwise uninhabitable land. Golden Gates Estates South, however, is shown as wetlands on the land use map (Figure B-2) because it remains undeveloped and is planned for restoration under the Conservation and Recreation Lands (CARL) program.

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TABLE I-1. Percent Land Use by Region.

Land Use	Charlotte Co. Area	Collier Co. Area	Glades Co. Area	Hendry Co. Area	Lee Co.	Monroe Co. Area
Agriculture	46%	12%	52%	61%	17%	0%
Urban	1	9	2	4	38	0
Wetlands	31	68	8	26	24	87
Forest	19	9	19	6	16	1
Rangeland	2	1	16	1	1	0
Barren	1	0	1	0	1	0
Water	0	1	1	0	2	12
Total Area (mi <sup>2</sup> )	208	1,908	316	607	1,027	472

Source: SFWMD, 1986-1988 data.

### Physical Features

#### Geography and Climate

The LWC Planning Area covers approximately 4,300 square miles. Average monthly temperatures in Southwest Florida range from 64.3 degrees in January to 82.6 degrees in August (SWFRPC, 1990). Annual average rainfall in the LWC Planning Area ranges from 51.77 inches in Hendry County to 54.50 inches in Collier County. Nearly two-thirds of annual rainfall occurs during the May to October wet season. Rainfall is further discussed in Appendix C.

#### Physiography

South Florida is characterized by low topographic relief and a high water table. With this type of flat terrain, a few vertical feet may have a profound effect on surface water drainage, vegetation, and settlement patterns. The dominant surface water feature of South Florida is the Kissimmee-Okeechobee-Everglades (KOE) drainage system, which is critical to the ecology of South Florida. The Kissimmee River, which is currently undergoing restoration, once meandered through a marsh floodplain into Lake Okeechobee. The natural outflow of the lake in the past was through the Everglades to the south. This sheetflow to the "River of Grass" has been replaced with a series of water control structures which regulate the stage and flow of the KOE drainage system.

A large part of the LWC Planning Area lies within the boundary of the Big Cypress physiographic province. This region, which is flat and has large areas with solution-riddled limestone at the surface, drains to the coastal marshes and mangrove swamps of the Ten Thousand Islands. The only major waterway in the LWC Planning Area other than the Caloosahatchee River is the system of canals in western Collier County which are monitored, controlled, and managed by Big Cypress Basin (a sub-unit of the SFWMD). The physiography of South Florida is discussed in further detail in "Environments of South Florida: Present and Past II" (Gleason, 1984).

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### **Population**

The estimate of total population of the LWC Planning Area for 1990 was 512,985. The total population is projected to increase 90 percent to 975,595 in 2010. Most of the population is settled in Lee and Collier counties. More detailed population figures and their associated demands are discussed in Chapter IV. The data sources and methodologies that were used to develop population estimates and projections are provided in Appendix G.

### **EVALUATION OF WATER SUPPLY ALTERNATIVES**

Ground water declines are expected to increase in the future, due to the projected increases in ground water withdrawals. A variety of adverse impacts may be associated with long-term declines in ground water levels. Adverse impacts were addressed by determining thresholds that define excessive water level declines (resource protected criteria), and comparing simulated ground water levels against resource protection criteria to identify potential future problem areas. Once these areas were identified, alternative model scenarios were developed to address these problem areas. These scenarios included reserving sources of water in competing use situations, increasing agricultural irrigation efficiency, increasing use of reclaimed water, and modifying control structures to increase the level of surface water. The evaluation of these scenarios, as well as other mechanisms (i.e., land acquisition) the District may use to minimize future water supply problems are discussed in Chapter VI.